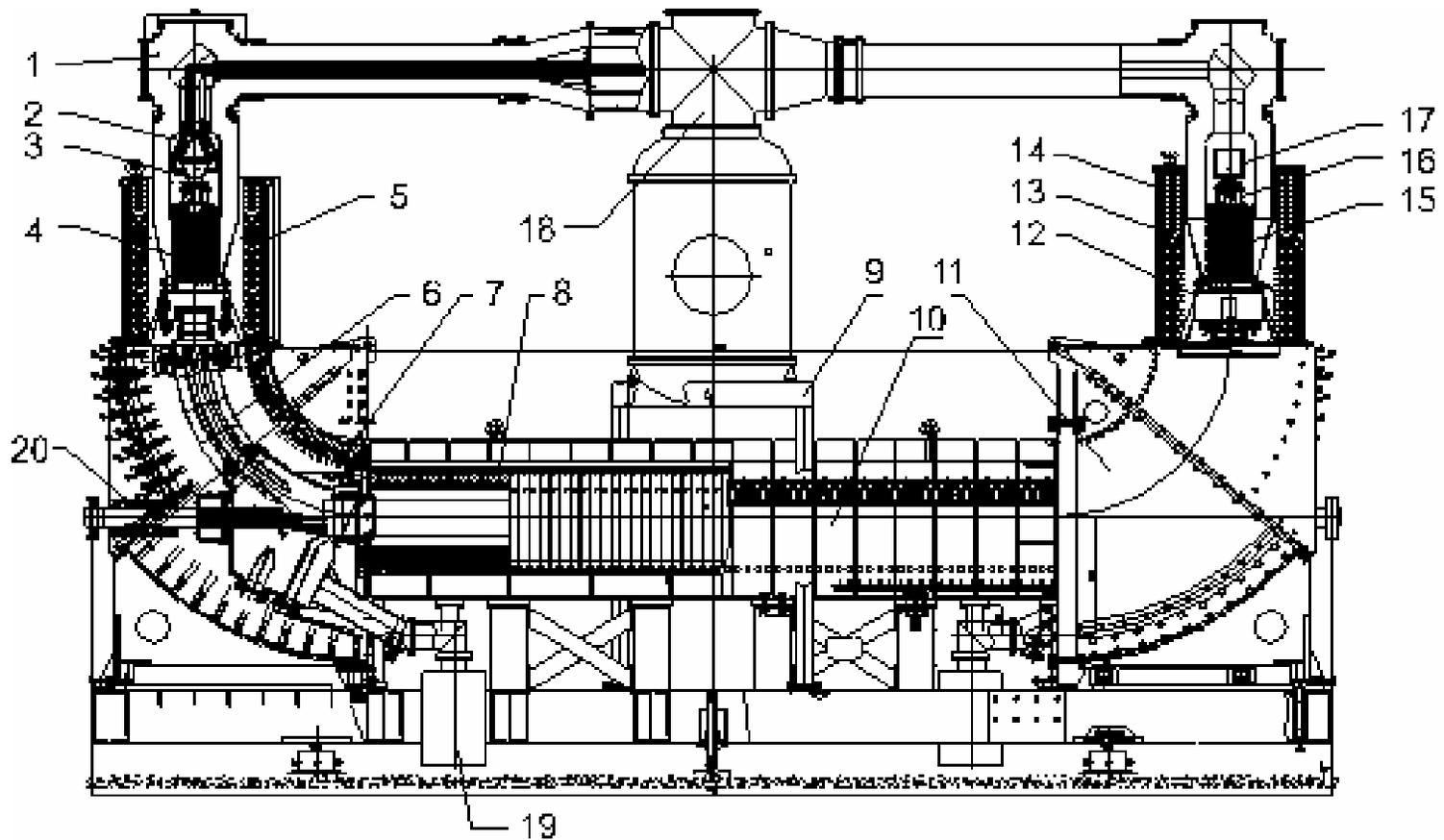


Commissioning electron cooler on 300 kV ECOOL05

E.Behtenev, V.Bocharov, V.Bublely, M.Vedenev, R.Voskoboinikov,
A.Goncharov, Yu.Evtushenko, N.Zapiatkin, M.Zakhvatkin, A.Ivanov,
V.Kokoulin, V.Kolmogorov, M.Kondaurov, S.Konstantinov,
G.Krainov, V.Kozak, A.Kruchkov, E.Kuper, A.Medvedko,
L.Mironenko, V.Panasiuk,

V.Parkhomchuk, V.Reva, A.Skrinsky, B.Smirnov, B.Skarbo,
B.Sukhina, K.Shrainer, BINP, Novosibirsk, Russia

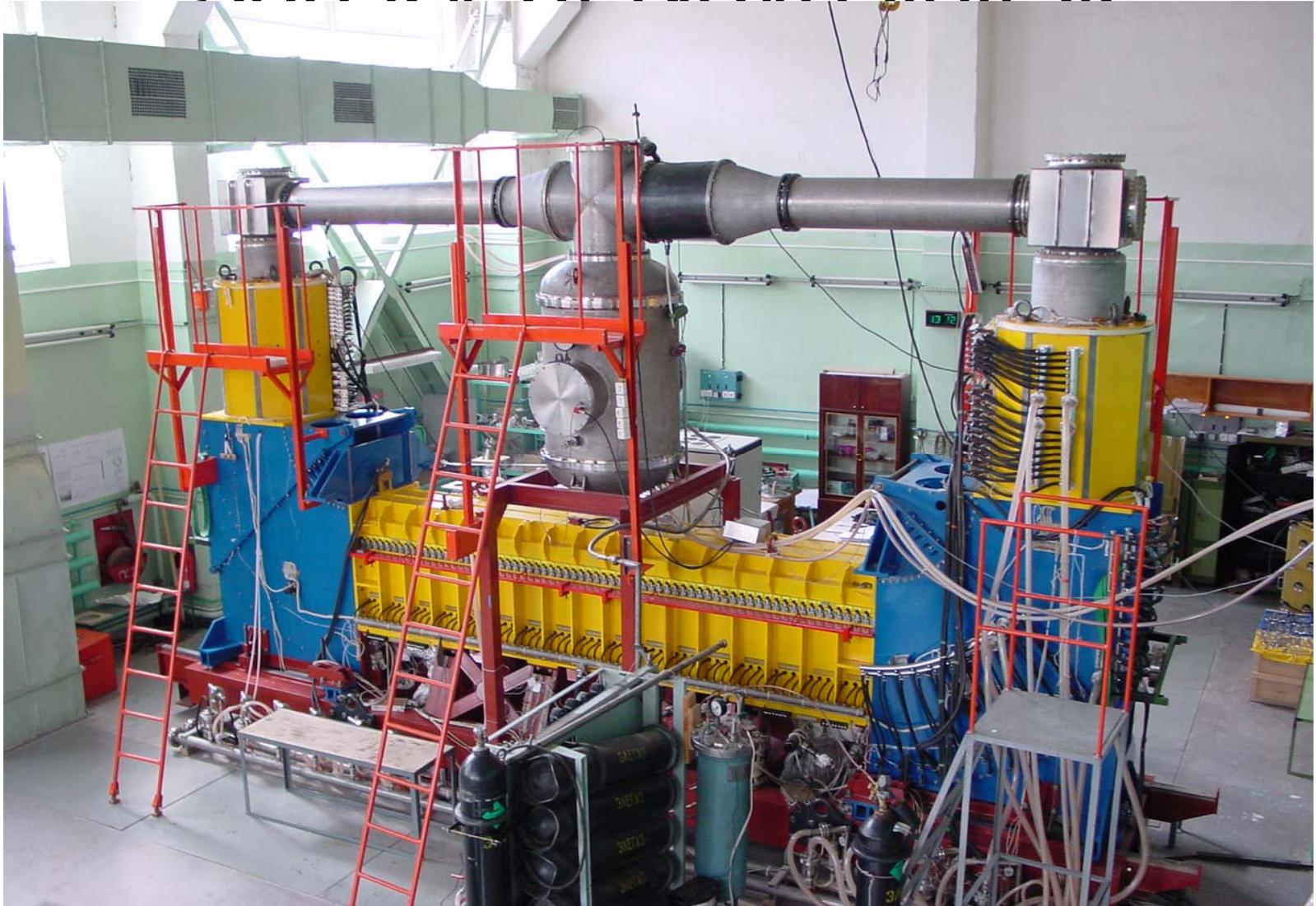
Yang X.D, Zhao H.W, Li J, Lu W, Mao L J, Wang Z X, Yan H B,
Zhang W, Zhang J H, IMP, Lanzhou, China



EC-300 1-high voltage line, 2-collector magnet shilding, 3-collector, 4-de accelerator tube, 5-magnet filed coils, 6-electrostatic bending, 7-toroidal coils, 8-coils cooling section, 9-high voltage vessel, 10-magnet yoke, 11- Ti pumping, 13-gun solenoid coils, 14-gun solenoid yoke, 15-acceleration tube, 16-electron gun, 17-concentrator of magnet field of electron gun, 18- high voltage terminal, 19-ion pump, 20- dipole corrector

Electron cooler EC-300

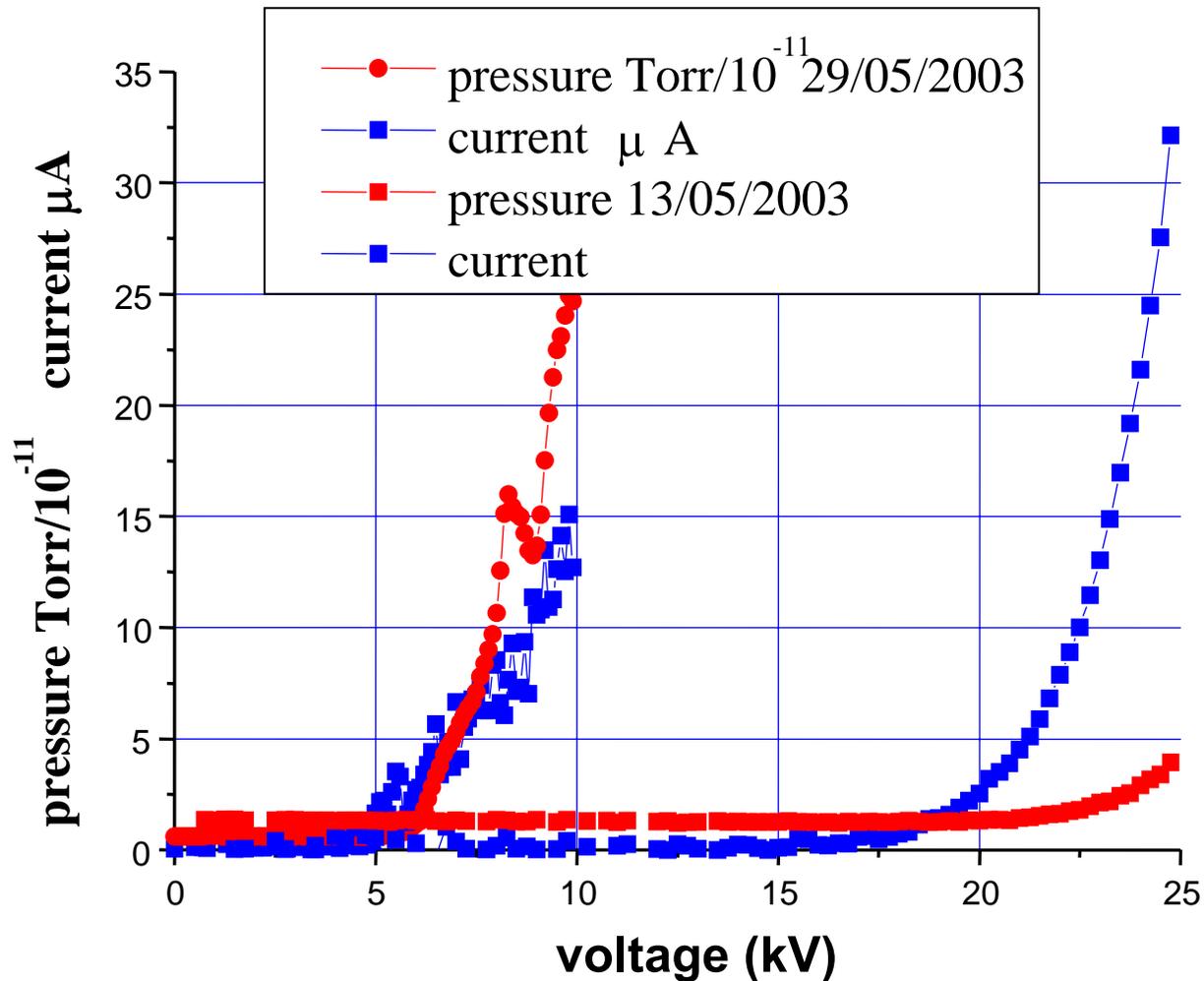
300 kV at Novosibirsk





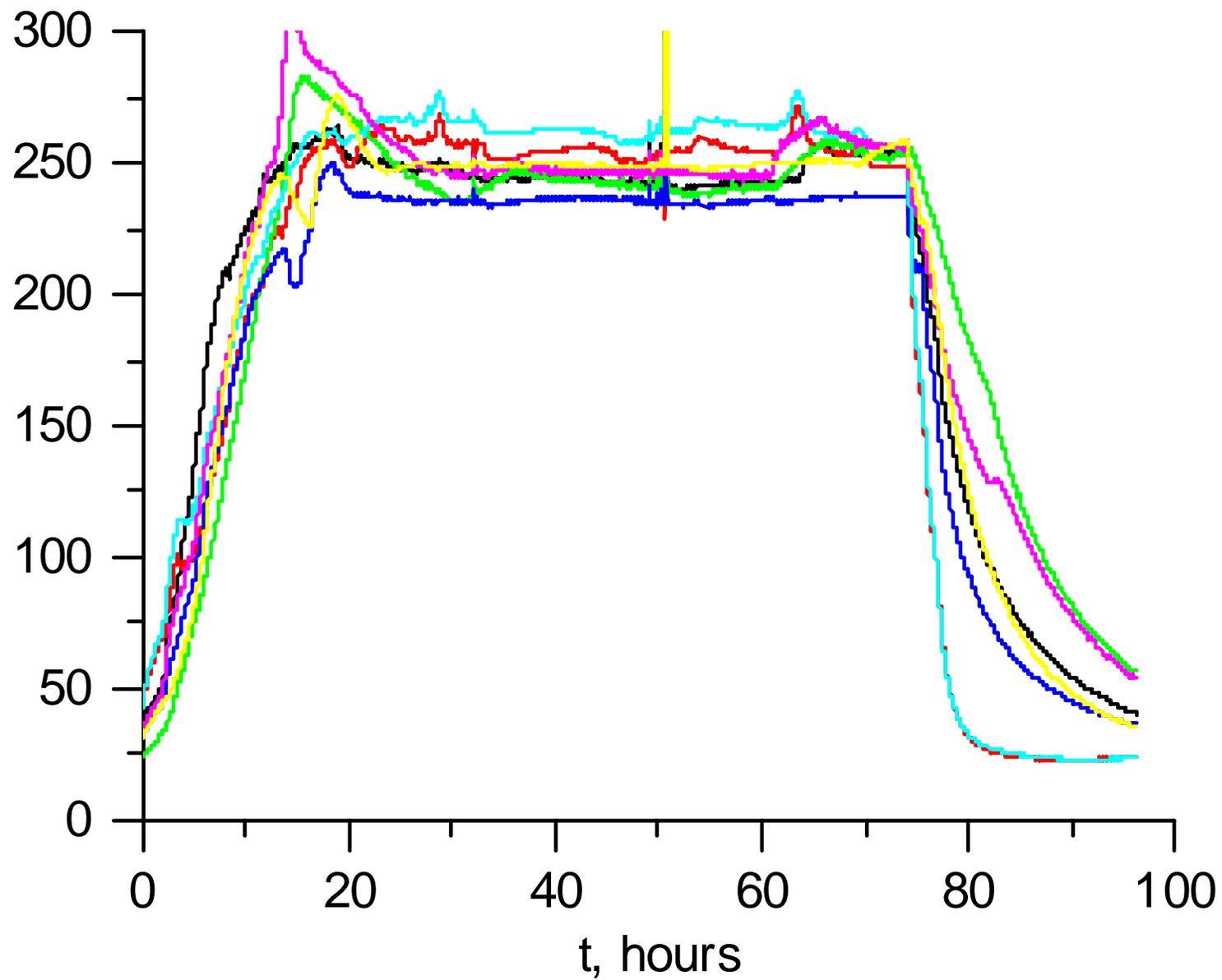
EC-300
at IMP
6.05.2004
after commissioning
with
maximal
voltage 250 kV
current 3 A 1A*150
kV
24 hours run

Problems of pollution of electrostatic plate- 2 weeks training at BINP from 5 kV to 25 kV



Vacuum (bake)

T, K

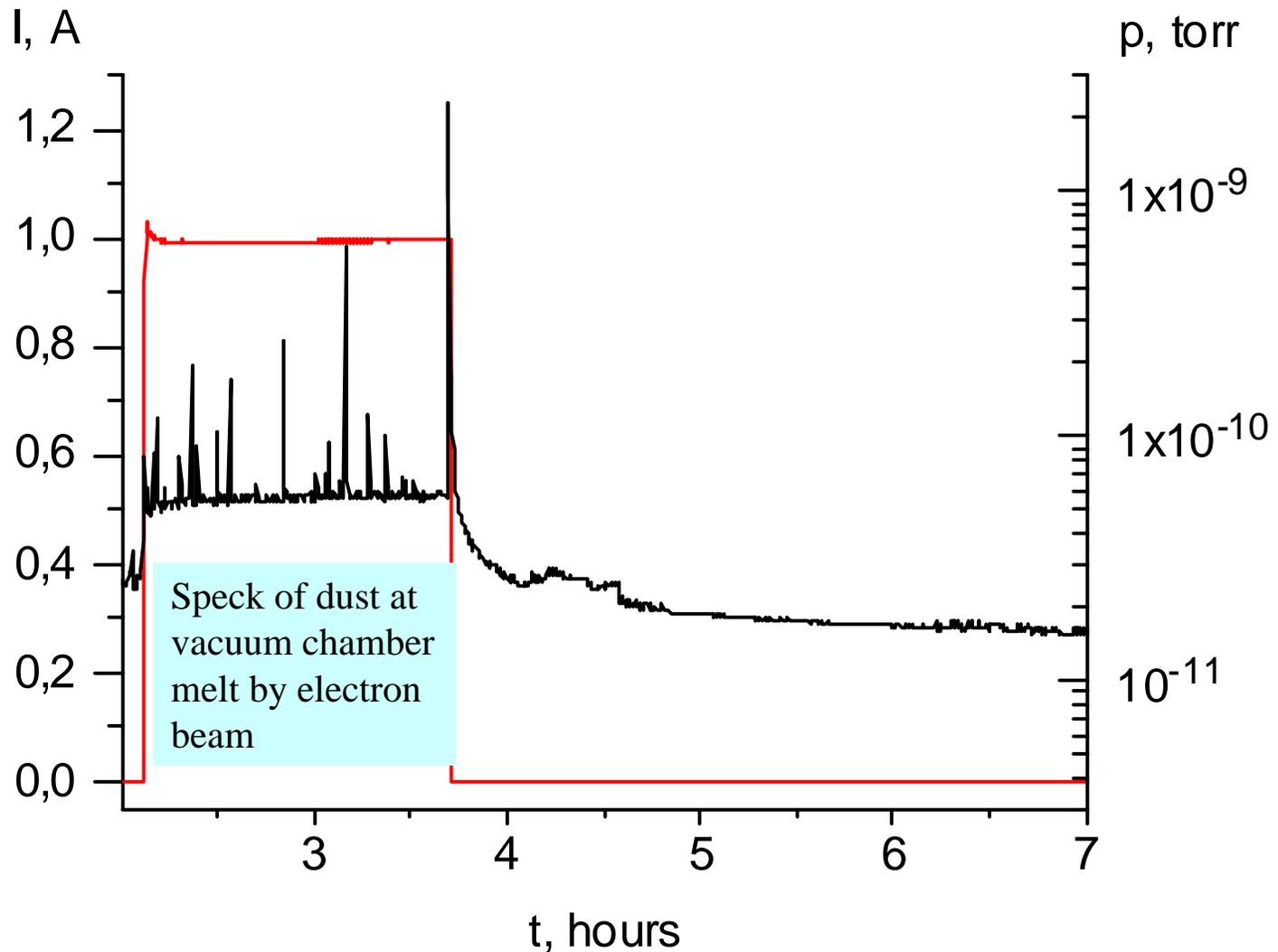


At time of commissioning at IMP
at moment of initial beam with energy 50 kV
strong outgasing with preassure $>3\text{E-}9$ Torr

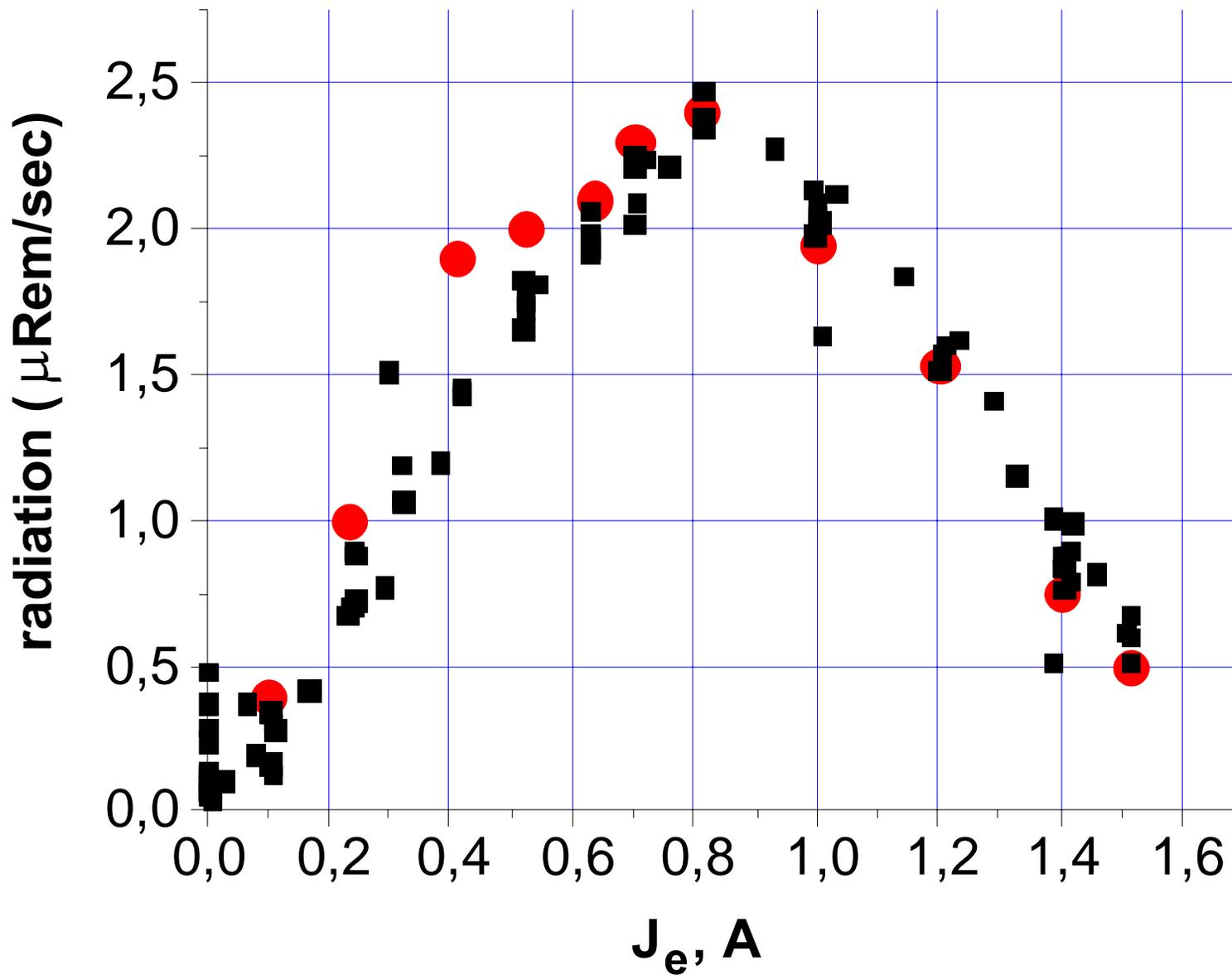
After backing electron beam with energy 50 keV was used for final clearing vacuum chamber.

Initial vacuum $2\text{E-}9$ Torr and for beam 0.25A the same oscillations at pickup electrodes was found. After few hours training vacuum pressure go to $5\text{E-}10$ Torr and oscillations disappear for current >1 A. The threshold electron current change inverse proportional vacuum pressure.

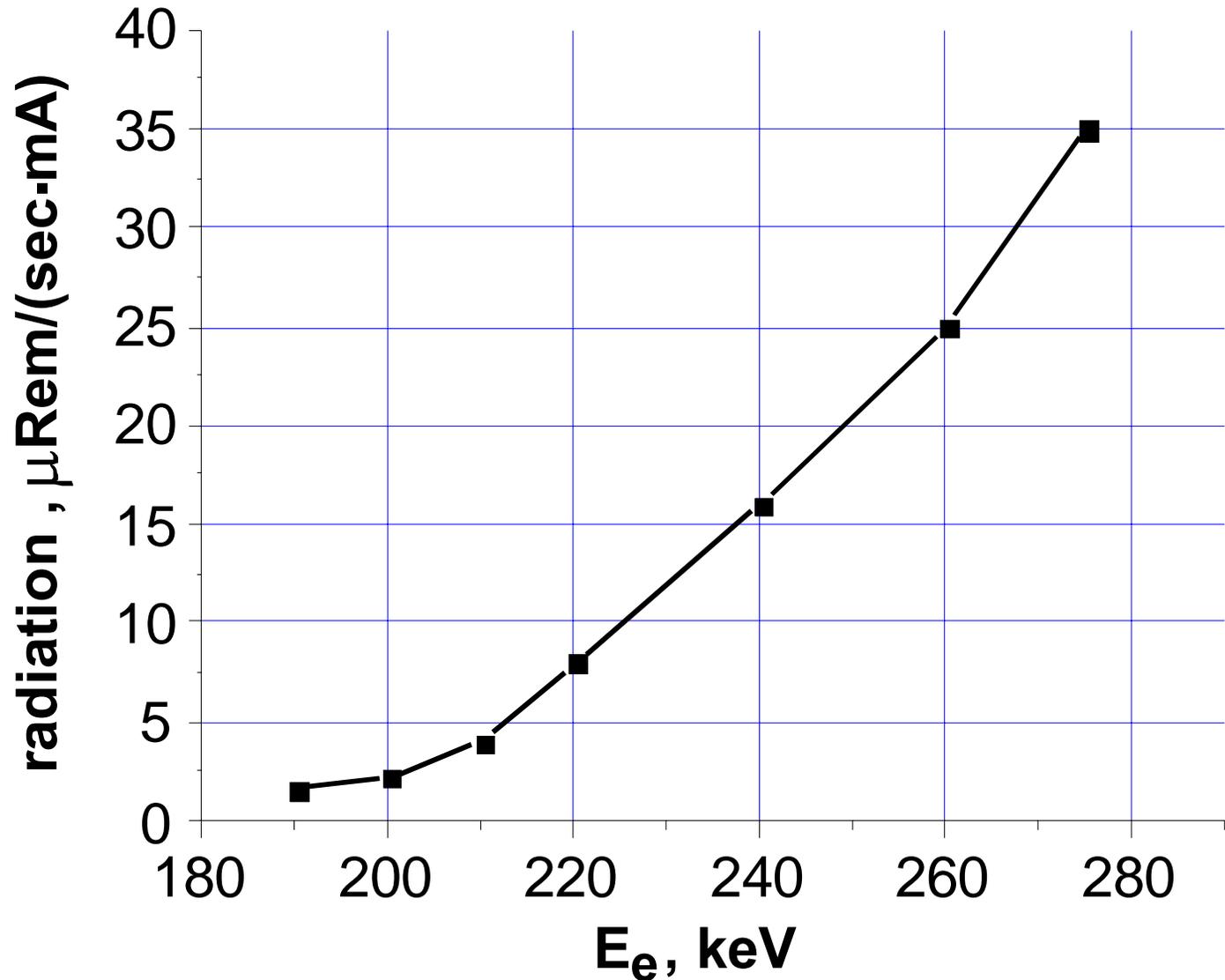
Vacuum with electron beam



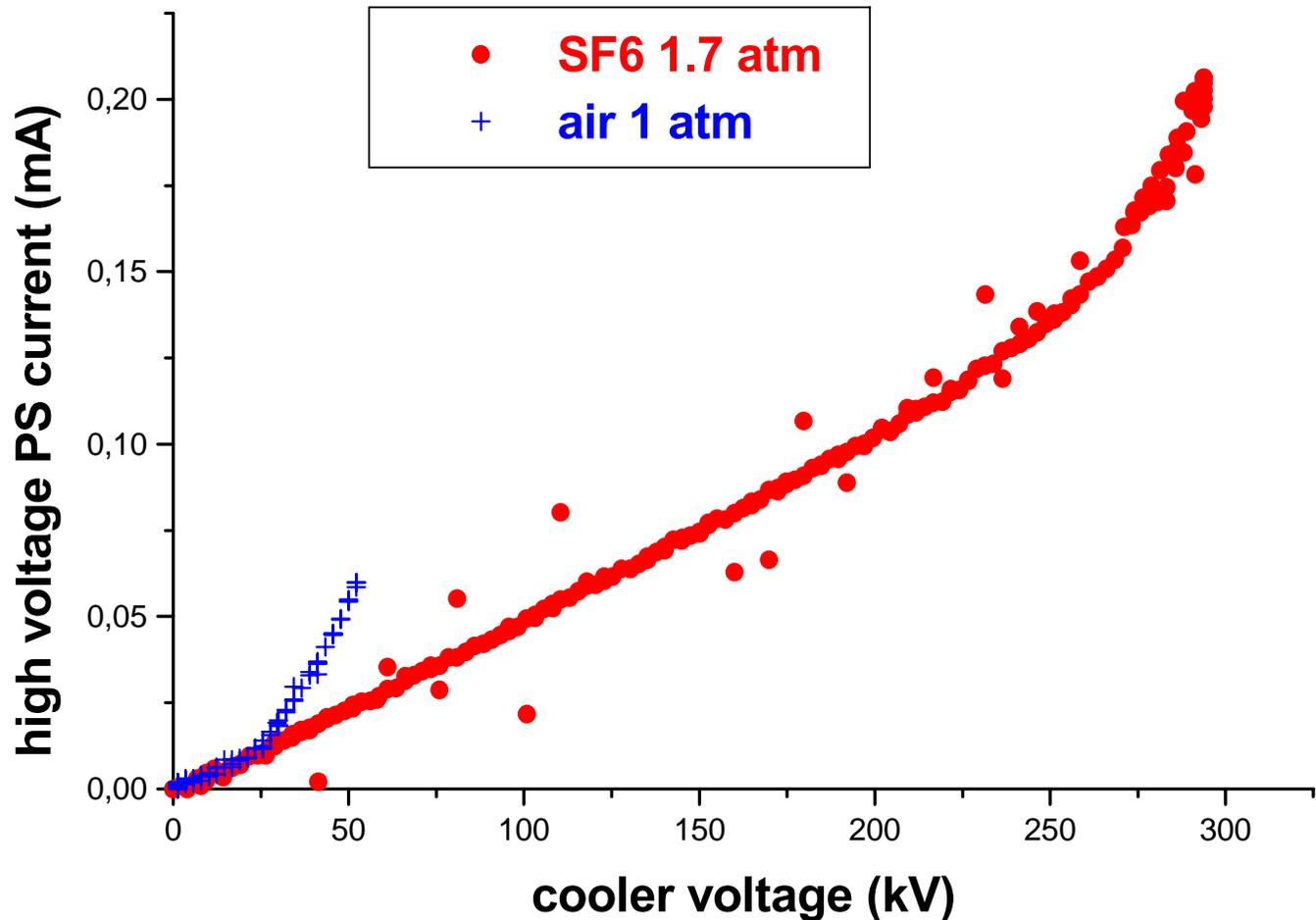
Radiation for different electron current (260 kV)



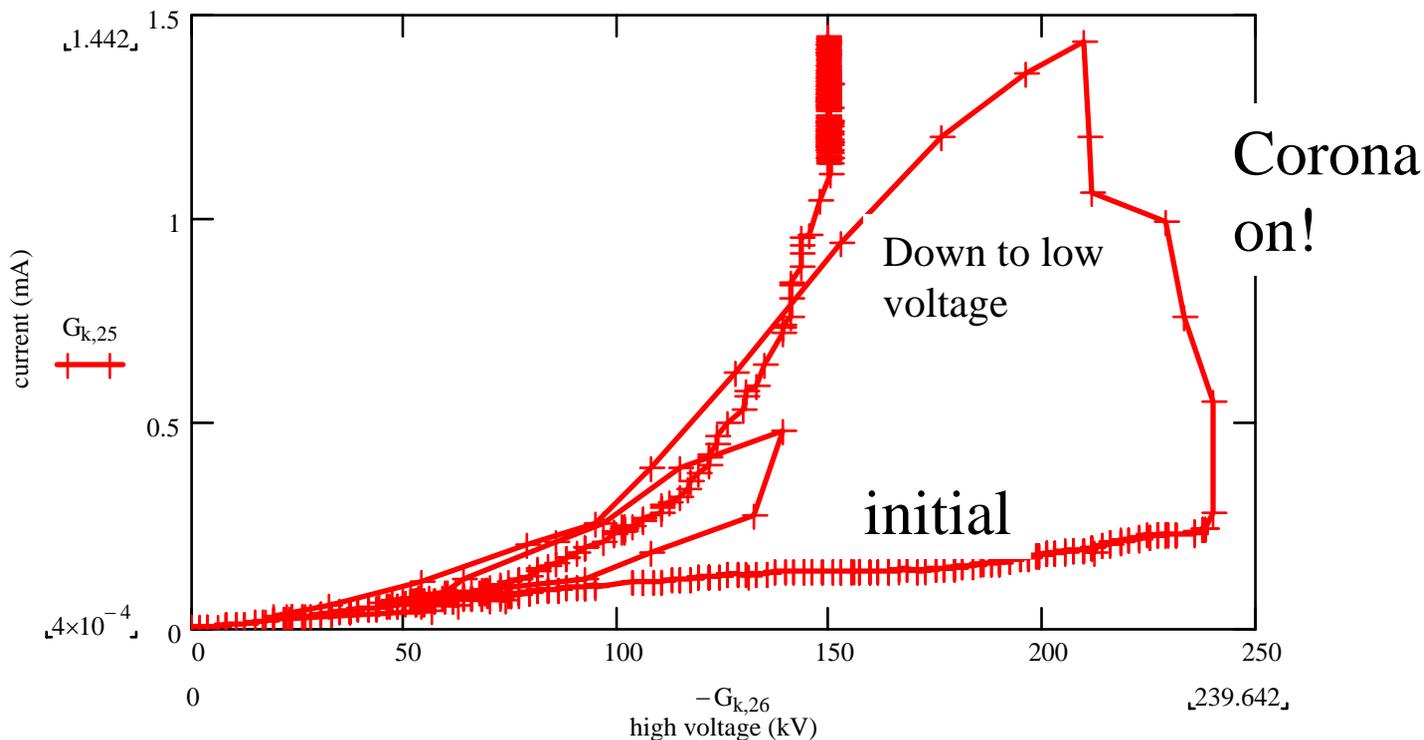
Radiation at 1 m from collector at gap magnet system



Problems high voltage



Corona happened at 240 kV with slow increasing to 1.5 mA after this for 150 kV high corona current with slow decreasing at time. SF6 with water? Drying help!. For stable operation should used clearing SF6 gas system.



- Commissioning with electron beam both coolers was successful
- Electrostatic bending means: low noise, better vacuum.
- High perveance electron beam with hollow beam will help
- optimized cooling and decreased losses ion beam by recombination
- Pancake design of magnet system showed reasonable accuracy
- Gas isolation should be calculated with more maximal voltage +30%
- (for not perfect gas)!
- Resistive damper at collector PS for operation with current more 1 A.
- High level oscillations without this damping resistor.
- Important to have commissioning with electron beam before
- using at ion ring.

Conclusion

Electron cooler was commissioning and operation at Novosibirsk and Lanzow with beam current up to 3 A voltage with beam up to 275 kV, vacuum less $5E-11$ Torr with electron beam 1 A.